Faculty of Technology Management and Technopreneurship

DETERMINING MANAGEMENT FACTORS OF OVERALL EQUIPMENT EFFICIENCY IN SELECTED MALAYSIAN PUBLIC UNIVERSITIES

Yunos bin Ngadiman

Doctor of Philosophy

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DETERMINING MANAGEMENT FACTORS OF OVERALL EQUIPMENT EFFICIENCY IN SELECTED MALAYSIAN PUBLIC UNIVERSITIES

YUNOS BIN NGADIMAN

A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy

Faculty of Technology Management and Technopreneurship

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2017

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DECLARATION

I declare that this thesis entitled "Determining Management Factors of Overall Equipment Efficiency in Selected Malaysian Public Universities" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature :

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Date : 3/8/2017

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APPROVAL

I hereby declare that I have read this thesis and, in my opinion, this thesis is sufficient in terms of scope and quality for the award of Doctor of Philosophy.

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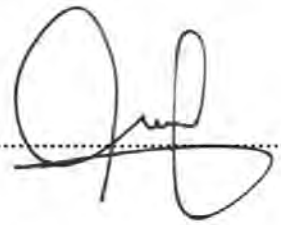
Signature : 

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DEDICATION

This doctoral thesis is dedicated to my late father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my late mother, who taught me that even the largest task can be accomplished if it is done one step at a time. Without their lifting me up when this thesis seemed interminable, I doubt it but bounced determination to resolve this thesis completely. I constantly pray that Allah placed them in a state of peace summoned their souls.

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ABSTRACT

Overall Equipment Efficiency (OEE) is a fundamental method of measuring the equipment performance tool for bringing maintenance and engineering to address the higher level of organizational performance. Determining management factors of OEE in this study is to enhance the machining performance in the engineering laboratories at the selected Malaysian public university. Nowadays, the management of the capital equipment is regarded as moderately viewed and based on the existing rules of asset management. However, an understanding of the overall management of laboratory management still does not have the importance factor including the administrative management system of laboratory equipment such as the training program of technical staff, capital equipment management, equipment maintenance and reliability engineering management without seeing the further machining performance. The engineering expert opinions was accounted and consistently agreed that the determination of the capital equipment performance should be established to define the significance of evaluating the performance of equipment in Malaysian higher learning institutions. Acting in accordance from the expert, a study of determining the direction of the equipment performance benchmarking is needed. Therefore, beginning the stage of this research is conducted for the purpose of determined the relationship between the Capital Equipment Management Factor (CEMF) and OEE in university perspective. The research methods used throughout this research were quantitative methods with two methods applied. The first method is the calculating the OEE performance ratios of twenty-five selected lathe machine in the engineering laboratory of the Malaysian public universities. The second method conducts a survey questionnaire with face-to-face to answer the all questions provided. The respondents are comprised of experienced technical staff with more than five years working in the management of laboratory equipment. There are six factors of CEMF were identified which included General Organizational Management, Departmental Organizational Management, Technical Training Program, Capital Equipment Management, Maintenance Management, and Reliability Engineering Management. Survey data was analyzed through the statistical method of analysis using SPSS version 23.0 to determine the normality of data, the reliability of the question asked, Spearman correlation and hypothesis testing. The methodological tool of Spearman correlation was used to analyze the correlation relationship between the CEMF and Individual Perceiveness and OEE performance. Therefore, the findings of this study presented the correlation test for each factor of CEMF was correlated with Individual Perceiveness. Meanwhile, the null hypothesis tested was denied and the alternate hypothesis tested shown the positive and acceptable result. It showed the relationship between the CEMF with Individual Perceiveness and OEE was inter-correlated.

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ABSTRAK

Keseluruhan Kecekapan Peralatan (KKP) adalah satu kaedah asas untuk mengukur prestasi pemesinan bagi membawa sistem penyelenggaraan dan kejuruteraan kepada tahap yang lebih tinggi terhadap prestasi organisasi. Faktor-faktor penentu pengurusan KKP dalam kajian ini adalah untuk meningkatkan prestasi pemesinan di makmal-makmal kejuruteraan, universiti awam Malaysia yang terpilih. Pada masa kini, pengurusan pemesinan berkapital dianggap sebagai sederhana dan masih berdasarkan peraturan yang sediada seperti pengurusan aset. Walau bagaimanapun, pemesinan yang menjelaskan pemahaman keseluruhan pengurusan makmal, pihak pengurusan masih belum menjadikan faktor utama termasuklah antaranya sistem pentadbiran pengurusan makmal, program latihan kakitangan teknikal, pengurusan pemesinan berkapital, penyelenggaraan pemesinan dan kebolehpercayaan pengurusan kejuruteraan tanpa melihat prestasi pemesinan dengan lebih jauh. Pakar-pakar dalam bidang kejuruteraan berpendapat secara konsistennya telah bersetuju bahawa penentuan prestasi pemesinan berkapital adalah perlu diwujudkan untuk menentukan kepentingannya bagi menilai prestasi pemesinan di institusi pengajian tinggi di Malaysia. Menurut pakar berkenaan, satu kajian bagi menentukan penanda aras prestasi pemesinan adalah diperlukan. Oleh itu penyelidikan diperingkat awal ini harus dijalankan bagi menentukan hubungan antara faktor pengurusan pemesinan berkapital dan KKP dalam perspektif di universiti. Kaedah penyelidikan yang digunakan dalam kajian ini adalah secara kuantitatif iaitu terbahagi kepada dua kaedah. Kaedah pertama ialah menentukan prestasi KKP keatas dua puluh lima buah mesin larik terpilih dalam makmal kejuruteraan mekanikal di universiti awam Malaysia setiap mesin dan mengira prestasi KKP masing-masing. Kaedah kedua ialah menentukan hubungan antara Faktor Pengurusan Peralatan Berkapital (FPPB) iaitu menyediakan soalan-soalan kepada responden yang terdiri daripada kakitangan teknikal yang berpengalaman iaitu lebih daripada lima tahun bekerja dalam pengurusan pemesinan makmal. Responden dikehendaki menjawab semua soalan secara bersemuka. Terdapat enam faktor dalam pengurusan pemesinan berkapital telah dikenal pasti iaitu Pengurusan Organisasi Besar, Pengurusan Organisasi Jabatan, Program Latihan Teknikal, Capital Management Equipment, Pengurusan Penyelenggaraan dan Pengurusan Kebolehpercayaan Kejuruteraan. Pengukuran data dianalisa melalui kaedah statistik dengan menggunakan perisian SPSS versi 23.0 untuk menentukan kenormalan data, kebolehpercayaan soalan yang ditanya, korelasi Spearman dan ujian hipotesis. Kaedah analisa korelasi Spearman digunakan untuk menganalisa hubungan bagi menentukan hipotesis antara FPPB dengan pandangan secara individu terhadap KKP dan prestasi KKP. Oleh itu hasil kajian ini menunjukkan ujian korelasi bagi setiap faktor dalam FPPB telah mempunyai hubungan terhadap pandangan individu dengan prestasi KKP. Sementara itu, ujian hipotesis nol adalah ditolak dan ujian hipotesis alternatif menunjukkan hasil yang positif dan boleh diterima. Ia menunjukkan terdapat hubungan antara FPPB dengan pandangan individu dalam KKP dan prestasi KKP adalah saling berhubung antara satu faktor dengan faktor yang lain.

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LIST OF ABBREVIATIONS

APEC	-	Asia-Pacific Economy Corporation
BM	-	Breakdown Maintenance
CE	-	Capital Equipment
CEM	-	Capital Equipment Management
CEMF	-	Capital Equipment Management Factor
CNC	-	Computer Numeric Controlled
CU	-	Comprehensive University
DOM	-	Departmental Organizational Management
GOM	-	General Organizational Management
HLI	-	Higher Learning Institution
HPT	-	Human Performance Technology
JH	-	Jishu Hozen
JIPM	-	Japan In-Plant Maintenance
KPI	-	Key Performance Index
KSA	-	Knowledge, Skill, and Attitude
LCC	-	Life Cycle Cost
MBTI	-	Myers-Briggs Type Indicator
MM	-	Maintenance Management
MOHE	-	Ministry of Higher Education
MP	-	Maintenance Prevention
MPU	-	Malaysian Public University
MTUN	-	Malaysian Technical University Network
OEE	-	Overall Equipment Efficiency

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PM	-	Preventive Maintenance
PredM	-	Predictive Maintenance
PreM	-	Periodic Maintenance
QA	-	Quality Assurance
QC	-	Quality Control
QFD	-	Quality Function Deployment
RAM	-	Reliability, Availability, Maintenance
REM	-	Reliability Engineering Management
ROI	-	Return on Investment
RU	-	Research University
SMRP	-	Society for Maintenance Reliability Professionals
SU	-	Specialized University
TEEP	-	Total Effective Equipment Performance
TIPS	-	Theory of Inventive Problem Solving
TOC	-	Theory of Constraints
TOTPM	-	Technology Oriented Total Productivity Measurement Model
TPM	-	Total Productive Maintenance
TQM	-	Total Quality Management
TTP	-	Technical Training Program
UiTM	-	Universiti Teknologi Mara
UM	-	Universiti Malaya
USA	-	United States of America
USM	-	Universiti Sains Malaysia
UTHM	-	Universiti Tun Hussein Onn Malaysia
UTM	-	Universiti Teknologi Malaysia

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Some of research contained in this research have been published as follows:

1. Ngadiman, Y., Hussin, B., and Abdul Majid, I., (2011). A Study of Human Skill Achievement in Malaysian Public Universities: Knowledge, Skill, and Attitude. *International Journal of Management and Technology,* 62, pp.1280-1292. ISSN: 0267-5730.

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CHAPTER 1

INTRODUCTION

1.1 Overview Research

This research was accompanied to determining management factors of Overall Equipment Efficiency (OEE) in selected Malaysian public universities. Strengthening of the Capital Equipment Management Factors (CEMF) was currently focused on the effective management of the Capital Equipment (CE) utilization in the university perspective (Liao, 2005; Daniel & Jeff., 2006). Searching through researchers or the literature related to OEE in Malaysia is not an easily accessible. From the limited source of researchers, it can be implied that OEE remains as a new area to be revealed and undertaken to Malaysian university perspective. However, the concept of OEE is applicable to all operations practiced the manufacturing plant and machinery (Suzuki, 1997; Fernandez, 2001).

The CE is an item considered to have a value and durability that used to provide a service or to make a product by Caernarven-Smith (1994), whereas, Liggett & Brenda (2005) has stated that CE is included with a long-lasting equipment acquired. It owned by the Malaysian public universities under the mechanical engineering laboratory. CE is expected to provide operating benefits over a long period of time, usually several years or more (Caenarven-Smith, 1994; Liggett & Brenda, 2005). Most organizations establish criteria for designating acquired items as either capital or non-capital items (McKone, 1996).

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